GEORGE H. REYNOLDS.

Improvement in Tube Fastenings of Condensers.

No. 116,098. Patented June 20, 1871.

Fig. 1.

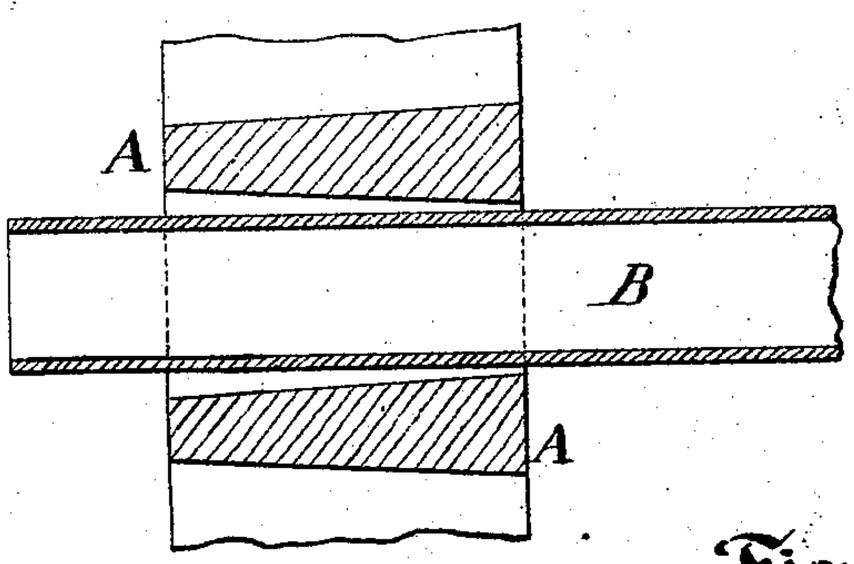


Fig. 3.

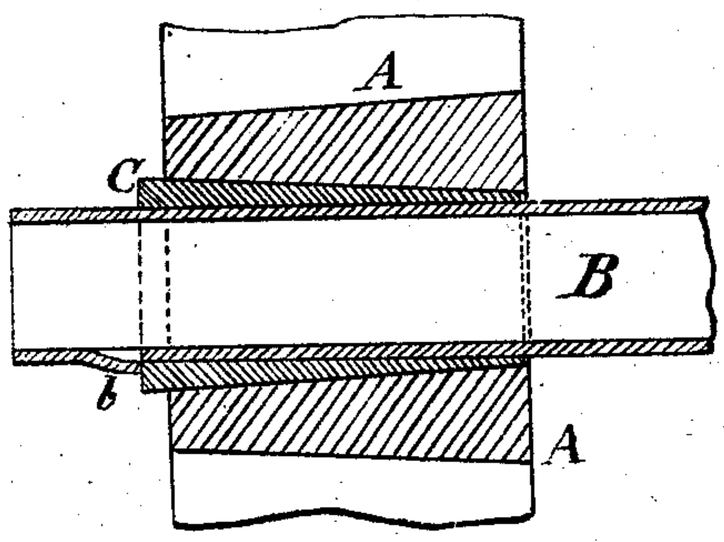


Fig. 5.

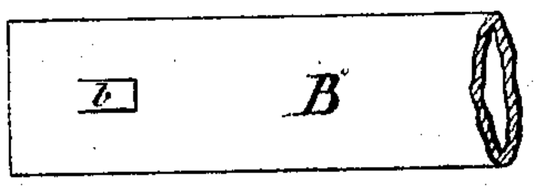


Fig. 2.

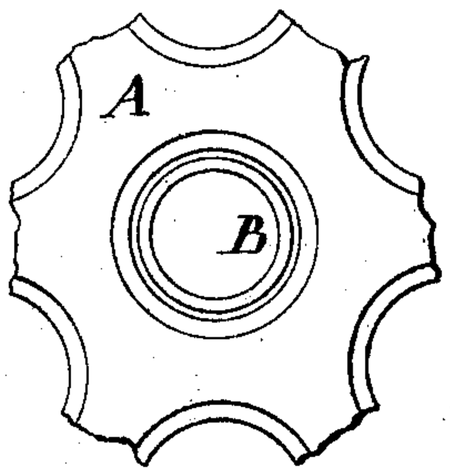
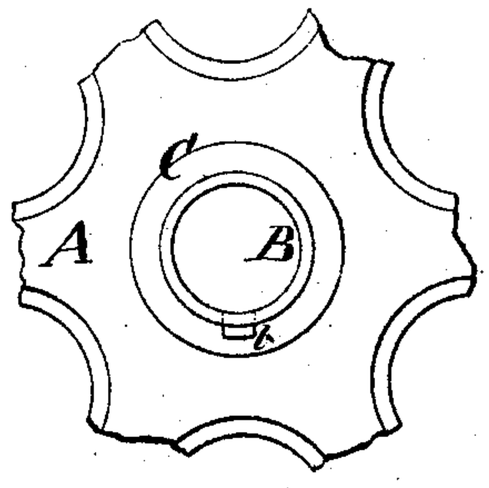


Fig. 4.



Witnesses,

A. Hoermann.

C. C. Livings.

Inventor.

Geo. H. Reynolds

by his attorney Thomas D. Stetson

UNITED STATES PATENT OFFICE.

GEORGE H. REYNOLDS, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF, C. H. DELAMATER, AND A. K. RIDER, OF SAME PLACE.

IMPROVEMENT IN TUBE-FASTENINGS OF CONDENSERS.

Specification forming part of Letters Patent No. 116,098, dated June 20, 1871.

To all whom it may concern:

Be it known that I, GEORGE H. REYNOLDS, of the city and county of New York, State of New York, have invented certain new and useful Improvements in Tube-Fastening of Condensers and analogous structures in which the tubes are held within packings with freedom to expand and contract by moving endwise to a limited extent.

The following is a specification.

My invention is adapted to be used with any ordinary tubes; but I will describe it as preferably using those manufactured by the Boston Brass-Tube Company, which are drawn from an ingot without joint or seam, and are perfectly cylindrical on their exterior surfaces. The tube-sheets are of cast-iron and of sufficient thickness to maintain their positions rigidly. Around each tube is a packing of wood. The wood may be pine or other soft woods. I have experimented successfully with a fine-grained maple.

Wood packings have been known before; but I provide peculiar forms and constructions, and hold the work with remarkable security and tightness. The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawing forms a part of this specification. Figure 1 is a section, showing the hole in tube-sheet and the tube in place without the packing. Fig. 2 is a corresponding end view. Fig. 3 is a section with the packing in place and fastened. Fig. 4 is a corresponding end view; and Fig. 5 is a view of a tube, and at a different angle, showing how the metal thereof is cut to allow it to be bent in the peculiar manner shown.

Similar letters of reference indicate like parts in all the figures.

The drawing shows one or more examples of each part which involves novelty. They represent, also, so much of the ordinary parts—the extent of the tube-sheet and the length of the tube, &c.—as seems necessary to give a correct idea of the construction.

A is the tube-sheet, and B B, &c., are the tubes. The tubes extend through larger conical holes made through the tube-sheet, which are preferably cored, both from considerations of economy and superiority in their effect. C C are tapering thimbles of wood, cylindrical on their interior and conical on their exterior. They are driven upon the tubes and enter and fit tightly within the tapering holes in the tube-sheet. The interior of the holes being rough gives greater certainty to their maintaining their places.

It is important that the tube be allowed a little longitudinal motion, yet such motion ought to be limited. If tubes are left entirely free to move endwise they are, obviously, liable to become displaced by a too great exercise of their privilege. I propose to employ my tube-fastening either at one end or at both ends of a tube, and the provision which I am now to describe for restraining end motion may be employed at either or both ends. It consists in peculiarly cutting and displacing a portion of the tube, the bent portion remaining fast to the tube at one end and being cut clear at the other. The cut end is presented toward the thimble C and the metal is displaced or bent outward from its ordinary position in the tube to a sufficient extent to cause the cut end to abut squarely against the wood of the thimble. It is well to so conduct the cutting that there shall be a little space—say a sixteenth of an inch—between the cut portion of the metal, which I will designate by the letter *b*, and the thick end of the tapering thimble C; but this is not absolutely essential. In case no such space is left, the softness of the wood thimble allows the metal *b* to crush itself into the wood a little ways whenever, in consequence of a difference of expansion between the tubes B and the body of the condenser, there is a little end motion of the tube in the fastening. I make the proper cut for the bent portion of the metal by means of a pair of cutting-pliers, one jaw of which is applied upon the outside and the other upon the inside of the tube. The operation of cutting and properly bending the part *b* can be conducted very rapidly.

The cutting and bending of a portion of the metal of a tube to aid in holding the tube in position, and also to aid in keeping a wood thimble in place, have been before practiced; but I am not aware that the metal has before been cut and presented in the same manner as mine—that is to say, with the end of the cut portion abutting directly against the thimble. It

has been usual to leave the bent portion attached at the opposite end, so as to present a kind of wedging resistance to the movement of either the tube or the thimble. I esteem my arrangement of the cut portion far preferable on account of the directness and completeness of its effect. The tube or thimble, or both, may be removed again after pressing in the bent portion *b*, so that it shall be restored to or a little within its original position. The tapering form of the holes in the tube-sheet and the corresponding form of the thimbles involve a very important advantage in the capacity for adapting the wood to the tube-sheet and making a tight contact, even if the parts, from shrinkage or other cause, differ a little in size. My tapering thimble may be driven in a little further if small, or left to project a little further if large; and in either case it will make a perfectly tight job on being driven in with a little force. If the cylindrical hole in the thimble C be of so large size as to fit very easily upon the tube B, the material will be drawn inward when the thimble is forced into the tapering hole, and by this diminution of its diameter will form a tight fit on the tube, either with or without the addition of moisture. Where my invention is employed only at one end of a tube the other end may be fitted tightly, and, if desired, very permanently by any ordinary means. It is not essential to success with any ordinary form of condenser or analogous vessel that the tube shall be free to move endwise at both ends.

I claim as my invention—

1. The tapering thimbles C, arranged, as represented, in correspondingly-tapered holes made through the tube-sheet A, so as to make a tight fit around the tube B and provide for variations in the sizes of the parts, as herein specified.

2. The arrangement of the cut and bent portion *b* of the metal of the tube so that its cut end shall abut against the thimble C to serve directly to prevent the end movement of the tube or thimble, as specified.

3. The entire tube-fastening, having a tapering thimble fitted in a tapering hole extending through the tube-sheet, and retained by an abutting portion, *b*, of the metal of the tube, all constructed and arranged for joint operation, as and for the purposes herein specified.

In testimony whereof I have hereunto set my name in presence of two subscribing witnesses.

GEO. H. REYNOLDS.

Witnesses:

THOMAS D. STETSON,

C. C. LIVINGS.